TECHNICAL SCHEDULE IV

ELECTRICAL WORKS

(To be completed by the Bidder)

4.1 The Bidder shall submit the filled in Technical Particulars for the all the Equipment / Items as indicated under item no. 4.1.1 to item no 4.1.14 in the prescribed format separately for Sewage Treatment Plants at various locations.

4.1.1 11 kV Metal Enclosed Switchboards

Sr. No.	Description	Unit	Technical Particulars
4.1.1.1	Make		
4.1.1.2	Type		
4.1.1.3	Applicable Standards		
4.1.1.4	Quantity	No	
4.1.1.5	Dimensions	mm	
4.1.1.6	**Switchgear cubicles and Bus bar ratings**		
(a)	Rated voltage, phases and frequency		
(b)	System Neutral Earthing		
(c)	Maximum system voltage	kV	
(d)	One minute power frequency withstand voltage	kV (rms)	
(e)	12/50 μsec impulse withstand voltage	kV (peak)	
(f)	Short circuit withstand		
	(i) Short time (1 sec) at rated voltage	kA (rms)	
	(ii) Dynamic rating	kA (peak)	
(g)	Reference ambient temperature		
(h)	Maximum temperature of bus bars droppers connectors and contacts at continuous current rating under site reference ambient temperature		
(i)	Continuous current rating of bus bar	A	
(j)	Bus bar material		
(k)	Bus bar Insulation		
(l)	Cable entry		
(m)	Cable type for Incoming and Outgoing feeders		

Sr. No.	Description		Unit	Technical Particulars
4.1.1.7	**Switchgear constructional Requirement**			
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partitions		mm	
(b)	Degree of protection			
(c)	Colour finish shade			
(d)	Earthing bus	i) Material		
		ii) Size	mm x mm	
(e)	Earthing conductor	i) Material		
		ii) Size	mm x mm	
4.1.1.8	**Breaker Particulars**			
(a)	Circuit breaker type			
(b)	Voltage, phases and frequency			
(c)	Rated operating duty			
(d)	Rated current at reference ambient temperature (i) Incoming breakers		A	
	(ii) Outgoing breakers		A	
(e)	Rated breaking capacity		kA (rms)	
(f)	Rated making current		kA (peak)	
(g)	Short time current withstand for 1 sec duration		kA (rms)	
(h)	Total break time			
(i)	Operating mechanism type (Normal)			
	Operating mechanism type (Emergency)			
(j)	Minimum no. of auxiliary contacts			
(k)	Withstand test voltage			
	(i) One minute power frequency		kV (rms)	
	(ii) 1.2/50 μ sec impulse		kV (peak)	

Sr. No.	Description	Unit	Technical Particulars
(l)	Auxiliary control voltage (i) For closing / tripping coil		
	(ii) For spring charging motor		
	(iii) For space heaters and lighting		
	(iv) Permissible variation in operating voltage of closing & tripping coils		
(m)	Anti-pumping feature		
(n)	Latching requirement		
4.1.1.9	**Current Transformers**		
(a)	Type		
(b)	Class of insulation		
(c)	Rated current ratio and burden (i) Incomers and bus couplers		
	(ii) Outgoing feeders		
(d)	Accuracy class (i) Metering		
	(ii) Protection		
(e)	Short time 1 sec current rating	kA (rms)	
(f)	Dynamic rating	kA (peak)	
4.1.1.10	**Voltage Transformers**		
(a)	Type		
(b)	Rated Voltage (i) Primary	V	
	(ii) Secondary – S1	V	
(c)	Method of connection (i) Primary – P		
	(ii) Secondary – S1		
(d)	Application – S1		
(e)	Rated burden	VA	
(f)	Accuracy class		
(g)	Rated voltage factor (i) Continuous		
	(ii) Short time		
(h)	Insulation class		
4.1.1.11 (a)	**Meters** Make		
(b)	Accuracy Class		
	(i) Indicating Meters		
	(ii) Energy Meter		
4.1.1.12	**Protective Relays**		
(a)	Type		
(b)	Auxiliary supply		
4.1.1.13	Annunciations Provided as per Part 12 - Particular Electrical Requirement of Specification		

Sr. No.	Description	Unit	Technical Particulars
4.1.1.14	Whether Cubicle Components Provided as per Part 12 - Particular Electrical Requirement of Specification	Yes / No	
4.1.1.15	Auxiliary A.C. Supply Voltage & Frequency	V, Hz	

4.1.2 11 KV/ 0.433kV Transformers

Sr. No.	Description	Unit	Technical Particulars
4.1.2.1	Make		
4.1.2.2	Type		
4.1.2.3	Applicable Standards		
4.1.2.4	Rated output	KVA	
4.1.2.5	Quantity required	Nos.	
4.1.2.6	Transformer location		
4.1.2.7	No load transformer ratio	kV/kV	
4.1.2.8	Number of phases		
4.1.2.9	Rated frequency	Hz	
4.1.2.10	Impedance at all taps	%	
4.1.2.11	No load loss on principal tap	W	
4.1.2.12	Load loss on principal tap and rated kVA	W	
4.1.2.13	Dimensions	mm	
4.1.2.14	Weight	Kg	
4.1.2.15	Number of winding / materials of conductor/Insulation Class		
4.1.2.16	Method of connection		
(a)	HV winding		
(b)	LV winding		
4.1.2.17	Vector group		
4.1.2.18	LV Neutral		

Sr. No.	Description	Unit	Technical Particulars	
4.1.2.19	Type of cooling			
4.1.2.20	Tap changer			
4.1.2.21	Tap range	%		
4.1.2.22	Tap step	%		
4.1.2. 23 (a) (b)	Terminal connection HV terminals LV terminals			
4.1.2.24 (a) (b)	Current Transformer On LV On LV Neutral			
4.1.2.25	LV Neutral earthing			
4.1.2.26	Insulation of Windings		H.V.	L.V.
(a)	One minute power frequency withstand voltage (dry and wet)	kV (r.m.s)		
(b)	1.2/50 micro second full wave impulse withstand voltage	kV (peak)		
4.1.2.27	Insulation of bushings		H.V.	L.V. (Line and Neutral)
(a)	Rated Voltage of bushing	kV		
(b)	One minute power frequency withstand voltage	kV (r.m.s)		
(c)	1.2/50 microsecond full wave impulse withstand voltage	kV (peak)		
(d)	Minimum creepage distance	mm		
4.1.2.28	Vacuum withstand capability of transformer main tank with bushings, radiations, fitting and accessories.			

4.1.3 415 V Metal Enclosed Switchgears (PCC) / MCC

Sr. No	Description	Unit	Technical Particulars
4.1.3.1	Make		
4.1.3.2	Type		
4.1.3.3	Applicable Standards		

Sr. No	Description	Unit	Technical Particulars
4.1.3.4	**415 V Switchgear and Busbar Ratings**		
(a)	Rated voltage phase and frequency		
(b)	System Neutral Earthing		
(c)	Maximum system voltage	V	
(d)	One minute power frequency voltage		
	i) Power circuits	V	
	ii) Control circuits	V	
	iii) Aux. Circuits connected to Sec of CTS	V	
(e)	Continuous current rating of Busbars under site reference Ambient Temperature and type & material	Rating Material	
(f)	Busbar insulation		
(g)	Reference Ambient Temperature	^{o} C	
(h)	Maximum Temperature of Busbars, Droppers and Contacts at Continuous current rating under site ambient temperature	^{o} C	
(i)	Short Circuit current withstand for Busbars and droppers (i) Short time 1 sec	kA (rms)	
	(ii) Dynamic Rating	kA (peak)	
4.1.3.5	**Switchgear Constructional Requirement**		
(a)	Type of Construction		

Sr. No	Description		Unit	Technical Particulars
(b)	Thickness of sheet steel (i) Frame, Frame enclosures, doors, covers and partitions		mm	
(c)	Degree of protection			
(d)	Colour finish shade			
(e)	Earthing bus	Material		
		Size	mm x mm	
(f)	Earthing conductor	Material		
		Size	mm x mm	
(g)	Minimum clearances in air of live parts (i) Phase to Phase		mm	
	(ii) Phase to Earth		mm	
(h)	Cable entry to cubicles			
4.1.3.6	**Instrumentation Transformers**			
(a)	Current transformer			
	(i) Ratio			
	(ii) Burden		VA	
	(iii) Accuracy Class			
(b)	Voltage transformer			
	(i) Ratio			
	(ii) Burden		VA	
	(iii) Accuracy Class			
4.1.3.7	Auxiliary A.C. Supply			

4.1.4 415V Power Capacitor and Control Panel

Sr. No	Description		Unit	Technical Particulars
4.1.4.1	**General**			
(a)	Make			
(b)	Type			
(c)	Applicable Standards			
(d)	Rated Capacity		KVAR	
(e)	Rated Supply Voltage		V	
(f)	Rated frequency and phases			
(g)	Reference Ambient temperature		^{o} C	
(h)	Cable gland required			
(i)	Type of cable			
(j)	Size of cable			
(k)	Cable entry			
4.1.4.2	**Constructional Requirement**			
(a)	Thickness of sheet steel i) Frame, Frame enclosures, doors covers and partition		mm	
(b)	Degree of protection			
(c)	Colour finish shade			
(d)	Main busbars and size			
(e)	Maximum Temperature of Busbars, Droppers and Contacts at Continuous current rating under site ambient temperature			
(f)	Earthing bus	Material		
		Size	mm x mm	
(g)	Earthing conductor	Material		

Sr. No	Description		Unit	Technical Particulars
		Size	mm x mm	
4.1.4.3	**Design Requirement**			
(a)	Insulation level		kV (rms)	
(b)	Capacitor bank connection			
(c)	Short circuit withstand for busbars i) Short time (1 sec)		kA (rms)	
	ii) Dynamic		kA (peak)	
(d)	Type of switching			
(e)	Switching steps			
(f)	Switch and Rating of contactor			
(g)	Incomer MCCB current rating			
(h)	O/L capacity of capacitors			
(i)	O/V capacity of capacitors			
(j)	Protections			

4.1.5 Diesel Standby Generator Set

Sr. No.	Description	Unit	Technical Particulars
4.1.5.1	**General**		
(a)	Set Manufacturer		
(b)	Quantity & Type	Nos	
(c)	Applicable Standard		
(d)	Rating	kVA	
(e)	Method of starting		
(f)	No. Of Phases, Rated Voltage, Frequency, PF and Speed		
(g)	Overload capacity		
(h)	Provision of Acoustic enclosure		
(i)	Provision of AMF Control Panel	Yes/ No	

Sr. No.	Description	Unit	Technical Particulars
	for all the DG Sets		
4.1.5.2	**Alternator**		
(a)	Manufacturer		
(b)	Type		
(c)	Applicable Standard		
(d)	Rating	kVA	
(e)	Voltage	V	
(f)	Number of phases		
(g)	Frequency	Hz	
(h)	Power Factor		
(i)	Rated Current	A	
(j)	Overload Capacity		
(k)	Class of Insulation		
(l)	Degree of protection		
(m)	Winding Connection		
(n)	Short circuit current		
(o)	Type of rotor bearings		
(q)	Provision of temperature sensors in stator windings		
(r)	Exciter		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(s)	AVR		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(t)	Voltage regulation		
(u)	Outgoing Cable		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Size		
(v)	Winding material		

Sr. No.	Description	Unit	Technical Particulars
(w)	Rating of biggest motor which can be started on DOL		
(x)	Details of protection		
(y)	Efficiency		
4.1.5.3	**Diesel Engine**		
(a)	Manufacturer		
(b)	Type		
(c)	Applicable Standard		
(d)	Rating	HP	
(e)	Speed	rpm	
(f)	Number of Cylinders		
(g)	Number of Strokes		
(h)	Type of Starting		
(i)	Duty		
(j)	Overload Capacity		
(k)	Radiator		
(i)	Make		
(ii)	Type		
(iii)	Fan power		
(iv)	Cooling air flow		
(l)	Exhaust system		
(i)	Type of Silencer		
(ii)	Exhaust temperature gauge range		
(m)	Governor		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Class of governor		
(n)	Cooling Water System		
(i)	Water temperature		
(ii)	Water Pressure		
(iii)	System Capacity		
(iv)	Provision of High water temperature and low water level		

Sr. No.	Description	Unit	Technical Particulars
	switches		
(o)	Lubricating oil system		
(i)	Grade of Oil		
(ii)	Oil Pressure		
(iii)	Oil temperature		
(iv)	Sump Capacity		
(v)	Oil Consumption per 100 hours		
(vi)	Recommended time period of Oil Change		
(p)	Fuel		
(i)	Fuel Specification		
(ii)	Fuel Consumption at rated Capacity		
(q)	Day oil tank		
(i)	Capacity	Litres	
(ii)	Provision of Level Gauge		
(r)	Starting system		
(s)	Type of cooling		
(t)	Exhaust system		
4.1.5.4	AMF Control Panel		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Constructional Features		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors covers and partition	mm	
(b)	Colour finish shade - Interior		
(c)	Colour finish shade - Exterior		
(d)	Degree of Protection		
(v)	AMF Features Provided as per Technical Specification	Yes/No	
4.1.5.5	Protections, Alarm, Indications & Control whether provided as per	Yes/No	

Sr. No.	Description	Unit	Technical Particulars
	Specification		
4.1.5.6	Acoustic Enclosure		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Constructional Features		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors covers.	mm	
(b)	Degree of Protection		
(c)	Acoustic material		
(iv)	Sound level at 1m distance		
(v)	Whether certified to meet emission norms	Yes/No	
4.1.5.7	Battery		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	Voltage		
(v)	Capacity at 10 hours rate		
(vi)	Number of successive starting permissible		
4.1.5.8	Battery Charger		
(i)	Make		
(ii)	Type		
(iii)	Applicable Standard		
(iv)	AC Input to Charger		
(v)	DC Output of Charger		

4.1.6 Variable Frequency Drives

Sr. No.	Description	Unit	Technical Particulars

Sr. No.	Description	Unit	Technical Particulars
4.1.6.1	**General**		
(a)	Make		
(b)	Type		
(c)	Applicable Standard		
(d)	Drive Application		
(e)	Quantity	No	
(f)	Type of converters		
(g)	Inverter capacity at specified pf		
(h)	Rated Current		
(i)	Load power factor		
(j)	Max. continuous current		
(k)	Rated voltage with number of phases		
(l)	Rated frequency		
(m)	Converter Bridge		
(n)	Single Quadrant/Two quadrant/ Four Quadrant		
(o)	Type of Duty		
(p)	Design Ambient Temperature		
4.1.6.2	Control Characteristics		
(a)	Speed Control		
(b)	Rated speed		
(c)	Speed ratio		
(d)	Constant torque/constant power		
(e)	Speed accuracy		
(f)	Closed loop/open loop		

Sr. No.	Description	Unit	Technical Particulars
(g)	Accel. / Deccel. time		
(h)	Possibility of Remote Operation	Yes / No	
4.1.6.3	Overall Harmonic Limitation	%	
4.1.6.4	Braking		
(a)	Type of braking		
(b)	Braking Torque		
4.1.6.5	Miscellaneous		
(a)	Soft-start	Yes/No	
(b)	Flying restart	Yes/No	
(c)	Auto restart	Yes/No	
(d)	Kinetic Buffering	Yes/No	
4.1.6.6	Confirm whether following minimum Indications on Drive Panel are Provided	Yes/No	
(a)	Motor running		
(b)	Motor stopped / trip		
(c)	AC mains 'ON'		
(d)	System Ready to start		
(e)	VFD system fault		
4.1.6.7	Confirm whether Digital Display of following Minimum parameters on the Drive Panels:	Yes/No	
(a)	Input AC Voltage		
(b)	Input AC Frequency		
(c)	Input AC Current		
(d)	Output Voltage		
(e)	Output Current VFD/Bypass		

Sr. No.	Description	Unit	Technical Particulars
(f)	Output Frequency		
(g)	Motor speed		
(h)	Whether Necessary transducers provided for indicating motor speed & current in PLC/DCS.	Yes/No	

4.1.7 Battery

Sr. No.	Description	Unit	Technical Particulars
4.1.7.1	Make		
4.1.7.2	Type of battery		
4.1.7.3	Applicable Standards		
4.1.7.4	Number of battery banks required		
4.1.7.5	Ambient conditions		
4.1.7.6	D.C. system voltage	V	
4.1.7.7	Ampere hour capacity of battery at 27 Deg. C at 5-hour rate to give final cell voltage of 1.16 volts/cell	Ah	
4.1.7.8	Momentary load/duration	A	
4.1.7.9	Emergency load/duration	A	
4.1.7.10	Continuous load/duration	A	
4.1.7.11	Nominal voltage	V	
4.1.7.12	Cell voltage - initial/final	V	
4.1.7.13	Discharge rate	Hours	

4.1.7.14	Number of cells per bank required to give rated voltage	No	
4.1.17.15	Number of spare cells per bank	No	
4.1.17.16	Overall dimensions		
4.1.7.16.1	Each Cell (L x W x H)	mm	
4.1.7.16.2	Complete battery in the rack	mm	
4.1.7.17	Mounting arrangement		
4.1.7.18	Charging method		

4.1.8 Battery Charger

Sr. No.	Description	Unit	Technical Particulars
4.1.8.1	**General**		
(a)	Make		
(b)	Applicable Standards		
(c)	Type		
(d)	Number required	No	
(e)	Rated Output voltage (DC)	V	
(f)	Rated Output	kW	
(g)	DC System Earthing		
(h)	Voltage regulation from no load to rated load	%	
(i)	AC ripple in DC output voltage at rated continuous load		
(j)	Type of rectifier		
(k)	Transformer		
(l)	Ambient Design Temperature	Deg. C	
(m)	Busbar material & size	-	

Sr. No.	Description	Unit	Technical Particulars
(n)	Overall dimensions	mm	
4.1.8.2	**Battery Details**		
(a)	Float/Trickle charging current of battery	mA	
(b)	Boost Charging Current of Battery (Maximum)	A	
(c)	Boost Charging Voltage of Battery (maximum)	V	
(d)	Maximum Time for Boost charging of Battery	hr	
(e)	Battery capacity & no. of cells	Ah	
		Nos.	

4.1.8.3	**AC System Data**			
(a)	Supply	Voltage	V	
		Phase		
(b)	(i) Variation in supply Voltage		%	
	(ii) Variation in supply frequency		%	
(c)	Short Circuit level		kA	
(d)	Type of earthing			
4.1.8.4	**Performance**			
(a)	DC voltage setting adjustment for float charger			
(b)	Voltage stabilisation for constant voltage regulator			
(c)	Maximum permissible variation in DC voltage (no load to full load)			
(d)	D.C. voltage setting adjustment for boost charging			
(e)	D.C. current adjustment for boost Charging			
(f)	Current stabilisation for constant current regulator for boost charger			

Sr. No.	Description		Unit	Technical Particulars
(g)	Minimum permissible power factor to rated continuous load			
(h)	Permissible ripple content at rated continuous load			
(i)	Relay for auto changeover from Float to boost mode to be provided (in case of float-cum-boost charger)			
4.1.8.5	**Constructional Features**			
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partition		mm	
(b)	Degree of protection			
(c)	Colour finish shade			
(d)	Busbar material & size			
(e)	Earthing bus	Material		
		Size	mm x mm	
(f)	Earthing conductor	Material		
		Size	mm x mm	
(g)	Cable entry			
(h)	Cable Sizes (i) Battery		sq.mm	
	(ii) DC output		sq.mm	
	(iii) AC input		sq.mm	

4.1.9 DC Distribution Board

Sr. No.	Description	Unit	Technical Particulars
4.1.9.1	**General**		
(a)	Make		
(b)	Applicable standards		

(c)	DC System voltage (Nominal)		V	
4.1.9.2	DC System Earthing			
4.1.9.3	Ambient Design Temperature		Deg. C	
4.1.9.4	Bus bar material, rating and size			
4.1.9.5	**DC Bus Load**			
(a)	Total continuous DC load		A	
(b)	Short time loads (Additional to continuous loads)			
	(i) DC lights/Facia lamps		A	
	(ii) Starting current and duration of Largest Connected DC Motor		A	
4.1.9.6	**Constructional Features**			
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partition		mm	
(b)	Degree of protection			
(c)	Colour finish shade			
(d)	Earthing bus	Material		
		Size	mm x mm	
(e)	Earthing conductor	Material		
		Size	mm x mm	
(f)	Cable entry			
(g)	Cable Sizes (i) DC Input from Battery		sq.mm	
	(ii) DC output to Load		sq.mm	

4.1.10 Non-Segregated Bus Duct

Sr. No.	Description	Unit	Technical Particulars

Sr. No.	Description	Unit	Technical Particulars
4.1.10.1	Type of Bus Duct		
4.1.10.2	Type of Cooling		
4.1.10.3	Installation		
4.1.10.4	Nominal Service Voltage	V	
4.1.10.5	Rated Voltage Class	V	
4.1.10.6	Continuous Current Rating of Bus Ducts under Site Conditions	A	
4.1.10.7	One-minute Power Frequency Withstand Voltage	V	
4.1.10.8	Momentary Current Rating	kA	
4.1.10.9	Short Time Current Rating for one second - kA (RMS)	kA	
4.1.10.10	Maximum Temperature (Hot Spot) of Busbars at Rated Current - °C		
4.1.10.11	Maximum Temperature (Hot Spot) of Enclosure at Rated Current °C		
4.1.10.12	Busbar Material		
4.1.10.13	Busbar Section		
4.1.10.14	Bus Enclosure Material		
4.1.10.15	Thickness of the Enclosure	mm	
4.1.10.16	Shape of Enclosure		
4.1.10.17	Phase Clearance (Minimum) Phase to Phase Phase to Earth	 mm mm	
4.1.10.18	Type of Joints between Adjacent Sections of Bus Conductor Welded/Bolted		

4.1.11Cables

Sr. No.	Description	Unit	Technical Particulars
4.1.11.1	**11kV (UE) XLPE Insulated Power Cables**		
(a)	Make		

Sr. No.	Description	Unit	Technical Particulars
(b)	Type		
(c)	Applicable Standards		
(d)	Cable size selection whether done as per Specification	Yes /No	
(e)	Continuous current rating with cable laid in air/ground under specified ambient temperature	A	
(f)	Conductor material		
(g)	Conductor screening		
(h)	Insulation		
(i)	Screening on Insulation		
(j)	Identification of codes		
(k)	Inner sheath		
(l)	Filler material		
(m)	Armouring		
(n)	Outer sheath		
(o)	Overall diameter of cable	mm	
(p)	Recommended minimum bending radius	mm	
(q)	Standard length of cable on each drum	Mtr.	
4.1.11.2	**1100 V Grade XLPE Insulated Power Cables**		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Cable size selection whether done as per Specification	Yes /No	
(e)	Conductor material		
(f)	Insulation		
(g)	Inner sheath		
(h)	Armouring		
(i)	Outer sheath		
(j)	Overall diameter of cable		

Sr. No.	Description	Unit	Technical Particulars
(k)	Recommended minimum bending radius	mm	
(l)	Standard length of cable on each drum	Mtr.	
4.1.11.3	**650/1100 V Grade PVC Insulated Control Cables**		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Conductor material		
(e)	Insulation		
(f)	Inner sheath		
(g)	Armouring		
(h)	Outer sheath		
(i)	Standard length of cable on each drum	Mtr.	

4.1.12 Lighting Fixtures and Accessories

Sr. No.	Description	Unit	Technical Particulars
4.1.12.1	**General**		
(a)	Illumination levels at various premises whether considered as per Specification	Yes /No	
(b)	Normal supply voltage, phase and frequency	AC	
		DC	
(c)	Variation in supply:		
	(i) Voltage (AC & DC)	%	
	(ii) Frequency	%	
	(iii) Combined voltage & frequency	%	
(d)	Design ambient air temperature	^{0}C	
4.1.12.2	Luminaire terminal suitable for		

Sr. No.	Description	Unit	Technical Particulars
(a)	Indoor area		
	(i) Conductor material		
	(ii) Cable size	Cores x mm^2	
(b)	Outdoor area		
	(i) Conductor material		
	(ii) Cable size	Cores x mm^2	
4.1.12.3	Luminaire earthing terminal suitable for		
	(i) Conductor material		
	(ii) Conductor size	SWG	
4.1.12.4	Luminaires		
(i)	LED Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		
(ii)	High / Medium / Low Bay LED Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		
(iii)	Flood Light LED Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		

4.1.13 Lighting System and Equipment

Sr. No.	Description	Unit	Technical Particulars
4.1.13.1	**System Particular**		
(a)	**Voltage**		
	(i) 3 Phase, 4 wire 50 Hz system		
	• Rated	V	
	• Maximum	V	
	• One minute withstand voltage		
	(ii) D.C. system		
	• Rated	V	
(b)	System short-circuit level		
	(i) At 415 V, A.C.	kA (rms)	
	(ii) At 110 V.D.C.	kA (D.C.)	
(c)	Reference ambient temperature	^{0} C	
4.1.13.2	**Distribution Board/Panels**		
(a)	Main, floor mounted distribution boards		
(i)	Main Lighting distribution board (A.C.)		
	• Make		
	• Type		
	• Degree of protection		
	• Bus bar material		
	• Bus bar current rating	A	
	• Short circuit current rating	kA	
	• Details of Incoming and Outgoing feeders		
	• Cable entry		

Sr. No.	Description	Unit	Technical Particulars
	• Location		
(ii)	Emergency lighting panel (D.C.)		
	• Make		
	• Type		
	• Degree of protection		
	• Bus bar material		
	• Bus bar current rating	A	
	• Short circuit current rating	kA	
	• Details of Incoming and Outgoing feeders		
	• Cable entry		
	• Location		
(iii)	Single phase DBs, wall/structure mounting		
	SLDB for indoor area		
	• Make		
	• Type		
	• Details of Incoming and Outgoing feeders		
	• Degree of Protection		
(iv)	SLDB for outdoor area		
	• Make		
	• Type		
	• Details of Incoming and Outgoing feeders		
	• Degree of Protection		
(v)	Paint Finish		
	(i) Colour shade:		

Sr. No.	Description	Unit	Technical Particulars
4.1.13.3 (a)	**Street Light Poles and Flood Light Poles** Street Light Pole		
	Type		
	Total Height:	Mtr.	
	Quantity:	No.	
(b)	Floodlight Light Pole		
	Type		
	Total Height:	Mtr.	
	Quantity:	No.	
	No. Of floodlights to be fixed per pole	No.	

4.1.14 Earthing and Lightning Protection System

Sr. No.	Description	Technical Particulars		
		Size	**Material**	**No. of Leads & Quantity**
4.1.14.1 (a)	**Main Earthing Grid** Buried in earth			
(b)	Buried in floor slabs in buildings			
4.1.14.2	**Conductor Leads to Equipment** (above ground)			
(a)	Transformers			
(i)	Transformer neutral to bottom of tank			
(ii)	From bottom of tank to earth grid			
(iii)	Transformer tanks and radiator bank			
(b)	Diesel Generator Set			
(i)	DG Set neutral earthing			
(ii)	DG Set body earthing			

Sr. No.	Description	Technical Particulars		
(c)	Fence posts and gates (Flex. braid)			
4.1.14.3	11kVMetal Enclosed Switchboard, 415Vswitchgear/ MCC.			
4.1.14.4	Motors			
(a)	415V Motors above 10 kW			
(b)	415V Motors up to 10 kW			
(c)	Fractional horse power motors			
4.1.14.5	**Other Items**			
(a)	Capacitor panel, Battery charger panel, DC distribution board, Main lighting D.B, Control panels and sub-lighting distribution boards			
(b)	Hand Rails			
(c)	Cable trays			
(d)	Tanks			
(e)	Junction boxes			
(f)	Lighting fixtures, receptacles, lighting conduits			
(g)	Push button stations, limit switches			
4.1.14.6	**Crane rail**			
4.1.14.7	Street lighting, flood lighting poles and junctions boxes			
4.1.14.8	Metallic non-current carrying structures			
4.1.14.9	**Lightning Conductors**			
(a)	Lightning protection down comers for building			
(b)	Lightning protection horizontal roof conductor for building			

Sr. No.	Description	Technical Particulars		
4.1.14.10	**Electrodes**			
(a)	Pipe electrode			

End of Schedule - IV